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blue PiraT2
User Manual
Version 2.0.1 - 24.11.2014

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3.   Overview

This user manual is only valid for the second generation of the blue PiraT data logger, called **blue PiraT2**.as well as for the newest generation, the **blue PiraT2 5E**.

In all functions and guides which are equal to both devices we use the name **blue PiraT2.** If there are differences in the handling of both versions they are mentioned in separate chapters.

This user guide describes the general functions and interfaces of the **blue PiraT2 / blue PiraT2 5E**, but not the different features of the blue PiraT2 which need a license.

This document refers to blue PiraT2 FW 02.00.01 and blue PiraT2 / blue PiraT Mini **TSL-Client (TSL = T**elemotive **S**ystem **L**ink) version 2.0.1. Some features depending on model and feature license or may not be available in older versions.

Software updates are frequently available in the Telemotive ServiceCenter. (You'll find the address under: Contact)

Please make sure to use always current firmware and software versions.

4.   System requirements

Control Unit
A Laptop or a PC is used to configure the devices by a software client. It also allows to save the recorded data and to use them offline.

blue PiraT2
The blue PiraT2 is an optimized data logger developed by Telemotive AG and now we released the newer version blue PiraT2 5E. It can be combined with Telemotives blue PiraT Mini to get an enhanced and flexible system which fits exactly to your requirements.

The communication of bus systems and control units are monitored and relevant data can be recorded very precisely with the blue PiraT2. The collected data are stored on the blue PiraT2 and can be downloaded to a PC or network storage for analysis.

TSL client
The software client for the blue PiraT2 and blue PiraT Mini, the **TSL Client** (**T**elemotive **S**ystem **L**ink), is needed to configure the data logger and later to download or convert the recorded data.

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5.   The blue PiraT2 system

The **blue PiraT2** is a data logger for the following interfaces:

- MOST25
- MOST150 incl. ECL
- High Speed CAN
- Low Speed CAN
- RS232
- LIN
- analog Input
- digital Input
- FlexRay
- Ethernet

The data logger can be mounted in a vehicle and due to his large storage capacity of the hard drive of currently 100 GB or higher, the blue PiraT2 is able to support extensive test runs. After the data has been gathered, the data has to be downloaded via Ethernet. For the download and the conversion of the logging data a software Client is available.

For the available providing conversion to various trace file formats please have a look at chapter 5. The blue PiraT2 is with different features available (see Table 4.1: blue PiraT2 data logger versions on page 22).

The blue PiraT2 is designed to create minimum interference with the vehicle's bus systems and interfaces. The data logger listens to the data traffic without operating as a bus node. Additionally to the data re-cording functionality, the blue PiraT2 provides online data processing functions:

- Simple CAN- and MOST filters
- A custom-defined CAN message can trigger the setting of markers (requires license complex trigger)

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5.1.　　Accessories

There are various accessories available for the **blue PiraT2** data logger:

- various adapter cables
- the blue PiraT Remote Control Voice, which allows for recording of voice notes additionally to the functionality of the Remote Control
- licenses which enhance the functionality of the blue PiraT 2
- assembly mount

Please contact Telemotive sales for more information about these accessories. Manuals are available from the Telemotive Service Center.

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5.2.   Implemented features

Some special features are already implemented into **blue PiraT2** and can be used by the user.

feature	description
Client library	C++ library to control all functions of the logger
Online compression	Allows to compress all trace-data to save HDD space.
ETH/GN logging	recording of Ethernet trace data according to GN log protocol or as TCP/UDP raw data
ESO Trace	Logging of Ethernet ESO Trace data Conversion of recorded data into JSON format
Ethernet Spy mode	Logging of all Ethernet RAW data (promiscuous mode)
Online Streaming	C++ online Streaming library
Online Monitor	Showing selected data online in the client software during the recording
Terminal Light	allows to download recorded traces from several blue PiraT Mini simultaneously
TSL	TSL = Telemotive System Link TSL allows to connect different Telemotive data logger and use this network as an enhanced data logger
Smartview *Basic*	Showing CAN signals in a HTML-5 compatible browser on mobile devices like Smartphones, tablets or laptops over WLAN (licensed feature). The basic version is limited to10 mobile devices and 20 signals which can be shown. *(Note: This functionality is available from FW version 2.1.1)*
Saving to external media	Logging trace data additional to external media like USB-sticks, external harddisks or SD cards. Data will be saved as offline data set and can be handeled by the TSL client or client library. *(Note: This functionality is available from FW version 2.1.1)*
Autosar System Template	Supporting of Autosar System Templates 3.2.2 for CAN and Flexray *(Note: This functionality is available from FW version 2.1.1)*
LIN Description File LDF	Supporting of LIN description files LDF *(Note: This functionality is available from FW version 2.1.1)*

Table 5.1: Implemented features

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5.3.   Additional features by optional licensees

Additional features can be activated by purchasing and installing licenses. Currently the following licensed features are available:

feature	description
Complex Triggers	certain events (e.g., conditions on CAN-signals) can be programmed to be a trigger for certain actions (e.g., display of a message on the remote control or send a Can message) The standard configuration of the blue PiraT Mini contains 2 complex triggers. This license allows configuring up to 50 complex triggers.
Remote Control Monitor	Display of configurable CAN-signals at the remote control
DLT logging	This supports logging of Diagnostic Log and Trace (DLT) messages over Ethernet or serial (restricted) connections.
Camera Link	Video recording via video server or network cameras
WLAN	Supporting wireless LAN
GPS logging	tracking of GPS data
Measurements with CCP	CAN Calibration Protocol
Measurements with XCP	Universal Measurement and Calibration Protocol. Still available for CAN.
MOST150 Streaming	Logging MOST150 synchronous/isochronous data
Signal based filtering	The feature **Signal based filtering** provides the possibility to extract preconfigured signals directly from the recorded CAN messages with an adjustable sampling frequency. These filtered signals can be stored directly to the logger and extract automatically in an MDF or CSV file.
Smartview *Enhanced*	Showing CAN signals in a HTML-5 compatible browser on mobile devices like Smartphones, tablets or laptops over WLAN (licensed feature) or Ethernet. The enhanced version has no limitation to mobile devices or signals which can be shown. *(Note: This functionality is available from FW version 2.1.1)*
Broad-R-Reach Logging	blue PiraT Mini supports recording of data over Broad-R-Reach Ethernet. *(Note: Just available for blue PiraT Mini)*

Table 5.2: Additional features by optional licensees

You find the user guides for these additional features in Telemotive's ServiceCenter.

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6.   The blue PiraT2 data logger

6.1.   Model versions of blue PiraT2

The blue PiraT supports a lot of bus systems which can be recorded by the data logger. This table shows which model supports which number of interfaces and channels.

Feature blue PiraT2	MOST25 (25M)	MOST150 (150M)	ECL	HS-CAN (C)	LS-CAN (C)	RC I/F	LIN (L)	FlexRay a/b (FR)	RS232	Digital In	Digital Out	Analog In	USB	1GBit Ethernet	100 MBit Ethernet
14C6S8L	-	-	-	12	2	1	8	-	6	1	1	1	3	1	4
25M24C8LFR	1	-	-	22	2	1	8	2	6	5	3	9	3	1	4
150M14C8LFR	-	1	1	12	2	1	8	2	6	5	3	9	3	1	4

Table 6.1: Model versions of blue PiraT2

The model name gives a hint to the integrated interfaces, e.g.: blue PiraT2 150M14C8LFR: 1x MOST 150, 12 HS-CAN, 2x LS-CAN, 8xLIN, 2x FlexRAY a/b, 1x 1GBit Ethernet and 4x 100 Mbit Ethernet interfaces. LS-Can and HS-CAN are counted only as CAN. The various interfaces are explained in later chapters.

Attention:
Based on the specification of the hard drive, the data logger should always be fitted vertically or horizontally (upright or upside down).

Please avoid tight bending of the MOST fiber optic cables.

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6.2. Front side connectors of blue PiraT2

On the front side of the blue PiraT2 you'll find the display and some control elements.

The blue PiraT2 is available with one 1 GBit Ethernet port on the front and also with four additional 100 MBit Ethernet ports, where an Ethernet switch is integrated. A mini switch is available with 4 RJ45 connectors.
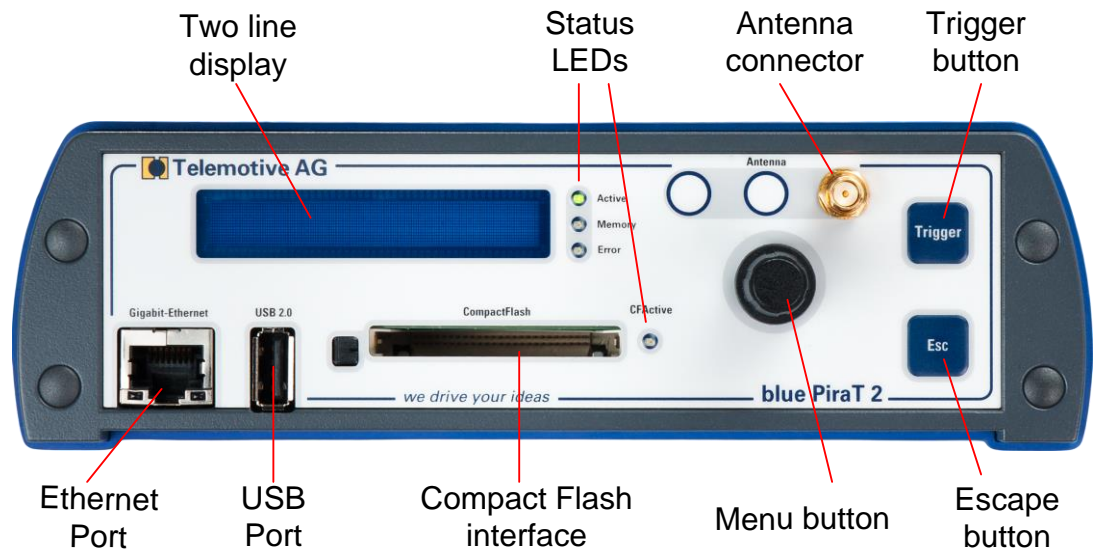
Figure 6.1: Front panel of the blue PiraT2

ATTENTION:
If you have ordered an external antenna eg. for GPS, the connector has to be bolt only by hand, NOT with any tools!

6.2.1. Front side connectors of blue PiraT2 5E

Figure 6.2: Front panel of the blue PiraT2 5E

6.3.   Interfaces at the rear side of blue PiraT2

MOST   Analog/Digital FlexRay   Multi function

Ethernet   Serial
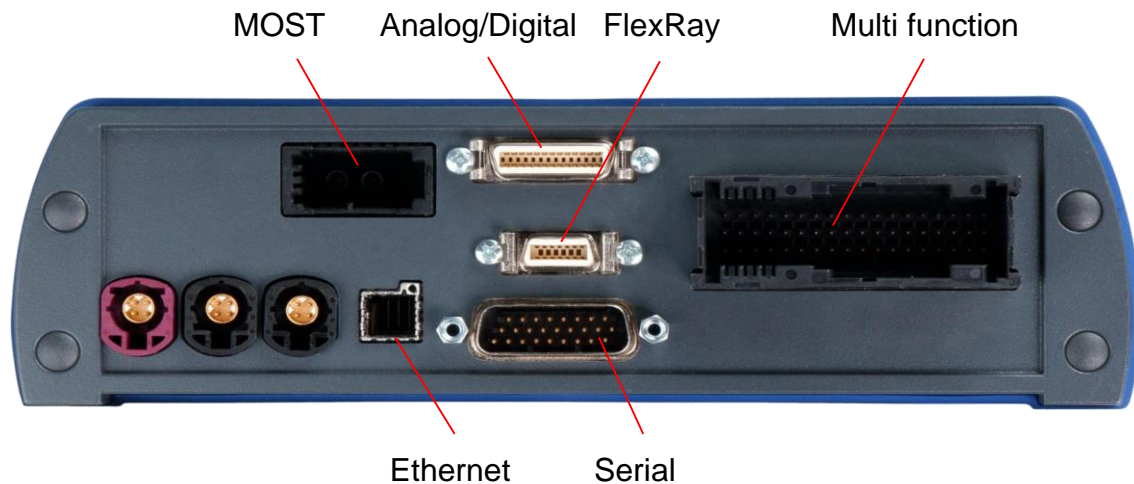
Figure 6.3: Back side of the data logger M150

On the various data logger types are the following connectors possible:

- Multi-function connector: This connector contains the remaining lines for power, high speed CAN 1-12, low speed CAN 12-13, the Remote Control Voice, LIN 1-8. The pin assignment of this connector is described in the chapter 15.1.

Warning:
It is possible that devices connected to the data logger might be damaged in case of an incorrect polarity of the data logger power supply.

- MOST: A standard 2+0 connector for MOST fiber optic.

Important:
If the MOST connector is not used, the jack must be covered with a terminating plug. This prevents the sensitive fiber optic contacts from getting dirty. It also makes sure that the data logger does not start up unintentionally when e.g. strong sunlight falls onto the optical contacts.

- Serial: This connector is described in the chapter 11.3
- Analog/Digital: Theis connector is described in the chapter 15.3.
- FlexRay: One connector for 2 interfaces with a / b. The pin assignment of this connector is described in the chapter 15.5.

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6.3.1. Interfaces at the rear side of blue PiraT2 5E

Figure 6.4: Back side of the data logger blue PiraT2 5E M150

7.   Using the blue PiraT2

The next section describes the usage of the controls and connectors of the blue PiraT2.
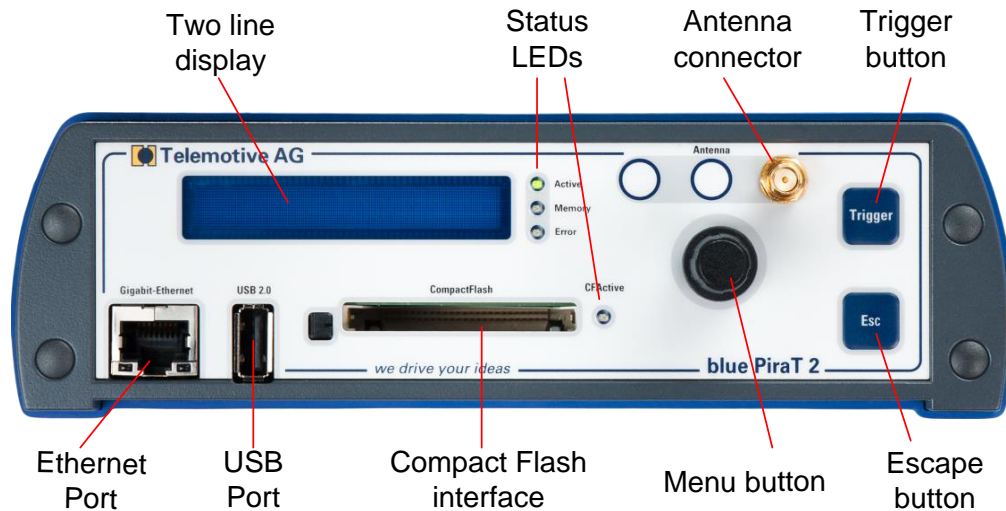
Figure 7.1: Front panel of the blue PiraT2

Attention:
At blue PiraT2 ONLY the front Ethernet port is available for controlling the data logger and download data!

7.1.   ON / Trigger button

The **[ON / Trigger]** button is used to switch on the blue PiraT2 if the data logger is connected to the power and currently into the sleep mode or off.

During operation, interesting points in time can be designated by the **[ON / Trigger]** button. When pressing this button, the data logger saves the current time to hard drive. It is possible to configure the data logger to send a CAN message as an acknowledgement of setting a marker. Additionally, it is possible to define a CAN message that triggers a marker. In all cases, triggers are debounced, allowing only up to ten triggers in between every two seconds.

When downloading the data, the Client displays all markers in an event overview. In this event overview, the client can be configured to transfer the data around the selected markers.

7.1.1.   Resetting the network settings

Important notice:
Due to a wrong network setting it might be impossible to reach the data logger any more. In this case the network configuration can be resetted by a long press of the [ON / Trigger] button (bP2 ca. 5 – 10 sec. / bP Mini ca. 20 sec.) to default settings: DHCP server with IP:192.168.0.233.

Afterwards the data logger can be reached again by using a direct connection with a PC/Laptop.

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7.2.   OFF / ESC button

If the blue PiraT2 is operating and you hold the **[OFF / ESC]** button for longer time, the data logger will go into the standby mode.

Otherwise the **[OFF / ESC]** button will be used for leaving the current menu state.

7.3.   Function of the LEDs

The blue PiraT2 has 4 LEDs on his front side: **[Active], [Memory]** and **[Error]** to the right side from the display and **[CF Active]** on the right side from the Compact Flash slot.

- **Active LED:**
  This LED is on as long as the data logger is operating.
- **Memory LED:**
  This LED is only active if the data logger is not in the ring buffer mode. The LED is blinking if the storage capability of the data partition is already filled with more than 75%. If the storage capability is used by 100%, the LED is continuous on.
- **Error LED:**
  If the Error LED is on, a series error occurred. This can mean that the error is still active or one or more errors are stored into the error memory.
- **CF Active LED:**
  The CF Active LED indicates that the blue PiraT2 has recognized the compact flash card.

7.4.   External memories

External memory can be used to download trace data from the data logger or to update firmware and licenses or install a configuration. It can be used to create a bugreport too.

7.4.1.   Compact flash card (CF):

The CF card has to be formatted in the FAT 16, FAT 32 or NTFS file format. The card reader supports Compact Flash 4.1 (CF UDMA Modes 0-4, CF Pio Modes 0-6).

We recommend using the "SanDisk Extreme CompactFlash 16GB" or the "STEC SLCF8GM2PUI CompactFlash" (fully suitable for automotive requirements).

7.4.2.   USB storage:

The USB storage has to be formatted in the FAT 16, FAT 32 or NTFS file format. You could connect USB flash drives and external hard drive up to a maximal supply current of 500mA. External power supplies must not connected to the hard disk.

7.5.   Menu button

For control the menu of the logger the [menu] button is used. The [menu] button has a rotary/push controller function. Rotate the button to the left equates to up and rotate it to the right equates to down. Pushing the button equates the OK function.

7.6.   The display

The menu includes the two line display at the front. The **[menu]** button is used for controlling the menu. Rotate the **[menu]** button to the left equates to an "up" function; rotate to the right equates to a

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"down" function. Pushing the [menu] button is equates to an "OK" or "enter" function. By pushing the **[ESC]** button the current menu item will be left.

But holding the **[ESC]** button pressed for more than 5 s, the logger will switch into the standby mode without any confirmation.

7.6.1.   Startup

During the Startup phase the display shows:

blue PiraT2

After the Startup phase is finished, the display shows the status of the most important interfaces. For a MOST25 version the MOST25 and FlexRay will be displayed on the beginning:

M25 -
FR   NN--

By rotating the **[menu]** button you can navigate through the entire interfaces. On the next table you can find the abbreviation for the displayed interfaces and the possible status information.

Abbr.	Interface	- = Off	X = Not connected	N = No Traffic	T = Traffic	E = Error
CAN	CAN	x		x	x	x
CCP/XCP	CCP/XCP	x	x	x	x	x
ETH	Ethernet	x	x	x	x	
FR	FlexRay	x		x	x	
LIN	LIN	x		x	x	
M25	MOST25	x	x	x	x	
M150	MOST150	x	x	x	x	
VID	Video	x	x		X	
SER	Serial	x		x	x	

Table 7.1: Interface Abbreviations and Status Information

7.6.2.   Menu mode

By pushing the **[menu]** button, you can enter the menu mode and you can see the following two lines.

    --- Menu ---

 [1] Info

Currently the menu has 5 main categories:

1.   Info
2.   Licenses
3.   Functions
4.   Error Memory
5.   Memory Card

The currently selected category is displayed inverted. By pushing the **[menu]** button, you can go into the selected menu main category.

    [1]   Info   1/9
    Firmware: 01.09.01

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Usually in the first line, the main menu category number and the name will be displayed on the left side. If one line has not enough space to display the name and the value, the first line will be used for the name and the second for the value.

On the right side the menu sub category number and the total numbers of sub categories will be displayed (See above).

7.6.3.   Info

This main menu category has currently 9 sub menu categories:

- Firmware: current firmware of the logger
- Hardware: Mainboard version of the logger
- Logger Serial No: Serial Number of the logger
- Date/Time: Date and time of the logger
- Storage: used storage of the hard disc
- Ext. Mem. Storage: used storage of the external memory
- Ext. Mem. Dev: status of the external memory
- DHCP: DHCP status
- IP: IP address of the logger
- Config: the name of the logger configuration
- WLAN-IP   optional WLAN IP address

By rotating the **[menu]** button you can navigate through the info list.

7.6.4.   Licenses

By entering this menu function the logger will lists all installed licenses. The message **[No Licenses]** appears, if no license is installed. By rotating the **[menu]** button you can navigate through the license list.

7.6.5.   Functions

Currently there are 3 functions available:

[Shutdown Device]
If this function will be started by pressing the **[menu]** button, the blue PiraT2 will enter into the standby mode without any confirmation.

[Reset IP Config]
If the logger has an unknown IP configuration and it is not possible to access the logger, there is a possibility implemented to reset the IP configuration back to the factory mode (DHCP Server).

Pressing the **[menu]** controller during the reset IP configuration function is selected, the logger is switching back to the DHCP server mode without any configuration. After that, the message **<IP Config reset to mode DHCP server>** will be displayed.

To assume this setting, a restart is necessary.

[Lock Keypad]
By activating this function via the menu controller the keypad will be locked without any confirmation.
By pressing the **[ESC]** key for more than 5 s, the keypad will be unlocked.

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7.6.6.   Error memory

This menu function lists all errors which are stored into the error memory. By rotating the **[menu]** button you can navigate through the error massages.

7.6.7.   Memory card

This main category has currently 8 sub categories. But these functions can be only executed, if an external memory device is installed. Otherwise the message <No Memory Device available> will be displayed.

Note: Never remove the External memory before pressing "Safely remove ext. mem.".

7.6.7.1.   Copy to memory card

There are 5 options available:

- Copy all data
- Copy data of last 60min
- Copy data of last 12 hours
- Copy data of last 24 hours
- Copy data of last 48 hours

By selecting one of the options and pressing the **[menu]** button the copy function will be executed and a progress will be displayed on the display. After the copy process is finished the message <copy done> will be displayed. By pressing the **[ESC]** button, the [Memory card] menu is shown.

The folder name of the offline data has the format "bp2_extMem_Offline_yyyymmdd_hhmmss". The date and time at the end of the filename is the time is the end of the selected data in the time standard UTC.

7.6.7.2.   Erase memory card

After pressing the **[menu]** button a verification message will be displayed. With escape the process can be stopped, by pressing the **[menu]** controller the blue PiraT2 starts to erase the whole device. After completion the message <Memory card successful erased> will be displayed.

7.6.7.3.   Format memory card

After pressing the **[menu]** button a verification message will be displayed. With escape the process can be stopped, with the **[menu]** button the blue PiraT2 starts to format the whole device. After completion the message <Memory card successful formatted> will be displayed.

7.6.7.4.   Install license

On the external memory device has to be a directory **license** where only one license file has to be stored.

If the external memory is inserted, now you can navigate to the point [Install license] and press the **[menu]** button. Now a verification message will be displayed. By press the **[Esc]** button you abort the process or continue by pressing the **[menu]** button. If you start the function, the message <Install licenses> will be displayed. If it was successful, the message <Successful install of license file> will be displayed. Otherwise the message >Install failed of license file> is shown.

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7.6.7.5.   Create bug report

By pressing the **[menu]** controller, the logger will display the progress level on the display. If the copy process is finished the message **<Creating bug report done>** will be displayed for a few seconds. The bug report will be stored on the external memory device as a zip file beginning with "Bugreport_bP2_All_…"

7.6.7.6.   Firmware update

On the external memory device has to be a directory **update** where the update file has to be stored.

By pressing the **[menu]** button a confirmation check will be displayed. Pressing again the **[menu]** button the update process will be start. The message <Updating firmware please wait> will be displayed. After a while this message will disappearing and a blank display is shown. Now the logger will be restarted. On the end of this restart process <**blue PiraT2**> will be displayed for few seconds. After that the progress of the update process will be displayed.

Attention:
Please note, that after you have update the firmware you should also update the client. Please refer to chapter 8.1 Download and installation of the TSL Client

7.6.7.7.   Install configuration

On the external memory device has to exist a directory **configuration** where only one configuration file has to be stored.

If you have choosen [Install configuration] the name of the existing configuration file will be displayed at the display. Pressing the [menu] button again will install the configuration and after that the message: <Successful install of Config file> should be displayed.

If the install of the configuration file was not successful, the message "Install failed of configuration file" will be displayed.

7.6.7.8.   Safely remove ext. mem.

Executing this function will unmount the external memory device. After that you can safely remove it from the data logger.

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8. Starting the bluePiraT2

Connect the blue PiraT2 via the power harness (**red/+/clamp30** and **black/GND/-/clamp31**) with the vehicle battery or a power supply.
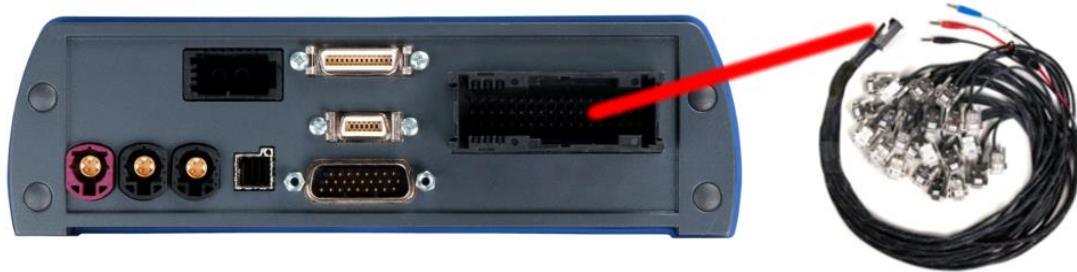
Figure 8.1: Power connection

ATTENTION:
If you have ordered an external antenna eg. for GPS, the connector has to be bolt only by hand, NOT with any tools!

Switch the blue PiraT2 on by pressing the **[ON / Trigger]** button and wait until the logger is ready. Telemotive Logo changes into showing the available bus ports.

Figure 8.2: Switching on

For switching off the blue PiraT2 later please press the **[OFF / Esc]** button for some seconds.

Pressing down the rotary knob will enter the Operation menu. Now select [1] Info, then choose 9/10 IP. This IP address is required for the next step.

Figure 8.3: Info screen IP address

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8.1.   Download and installation of the TSL Client

Open your internet browser and enter the IP address (Default: **192.168.0.233** or see chapter 0).

Figure 8.4: downloading the TSL client directly from the blue PireT2

The connection between the logger and your computer system will be established. Please take care the the network settings of your network adapter are set to **[Optain IP address automatically].**

Please click on the blue PiraT Mini image to start the download of the client (~65MB) directly from the logger. Then choose **[Save]** to save the file to your local computer.

The installation setup can be started by a double klick on the setup file. Follow the instructions, choose a destination directory and finalize the installation by pressing **[Install].**

Note:
Before you start the TSL Client setup, make sure that a 32bit Java Runtime Environment (JRE) is installed to your PC.

The client tries to install the necessary Java version if there's no installation on your system. Maybe this is not possible due to missing rights on your computer system.

If the Client installer can't install the version or did not find a correct Java (32bit) installation, the following massage is shown.
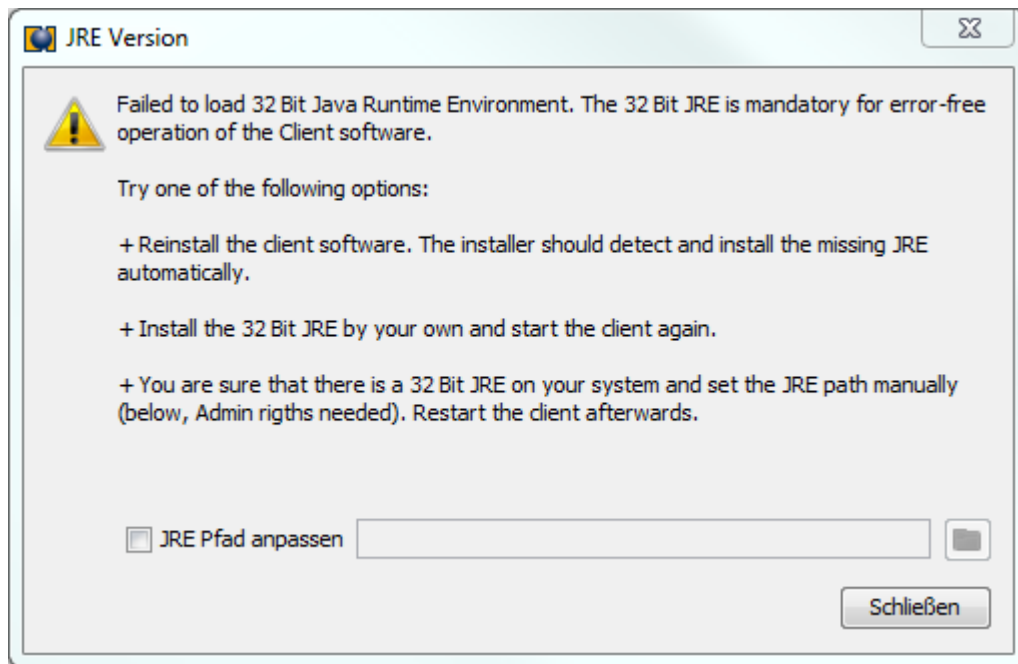
Figure 8.5: Error Massage: JRE not found

Here you can see the possible solutions. If you chose the third solution, you need admin rights on your PC. Please open the client by pressing the right mouse key and choosing "run as administrator"

The default path of the 32 bit Java at Windows 7 is C:\Program Files (x86)\Java\jreX.

After successful installation you will find a blue Pirat2 client icon on your desktop. Double-click the icon to start the application.

Figure 8.6: Desktop symbol

You can download the entire **manual for the TSL client** in our ServiceCenter. In the manual, all these operations are described:

- detailed description of the TSL client
- configuration of the data logger
- download of the recorded data
- conversion of the recorded data
- Firmware-/ License update
- Creating a bug report

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9.   Adapter cables

This section describes which adapter cables are available for the bluePiraT2.

9.1.   Universal adapter cable

Telemotive AG offers adapter cables that connect to the multi-function connector and split up its lines to separate connectors.
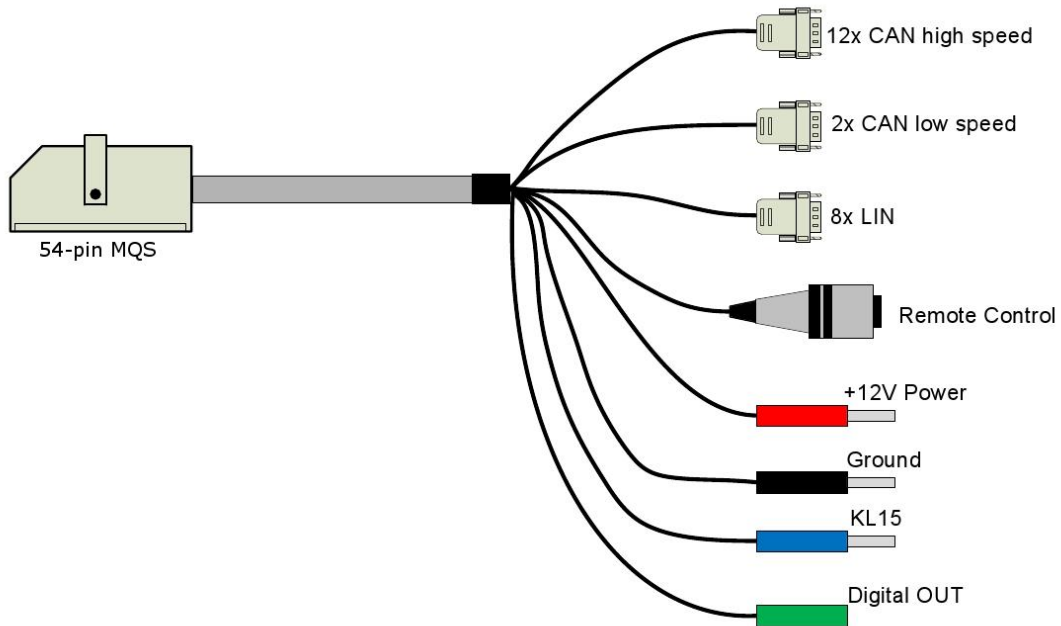
Figure 9.1: Connecting the blue PiraT2 via the universal adapter cable

9.2.   Adapter cable Serial/RS232, Analog/Digital

The Figure 9.2 shows the adapter cables for 6x RS232, one digital IN and one analog IN.
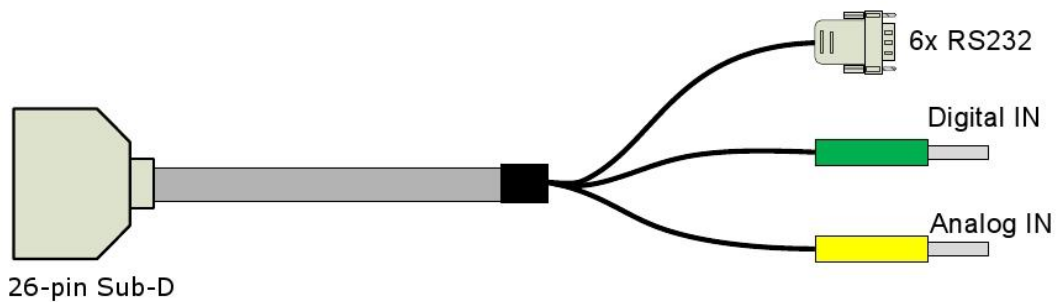
Figure 9.2: RS232/digital/analog adapter cable

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Note:
The blue PiraT2 actively sends data on the "Tx" line if a protocol for the serial port is configured. The "Tx" line must only be connected to special devices that support those protocols. If the application is listening to a bidirectional serial communication of two devices, two serial ports of the blue PiraT2 have to be used. The "Tx" lines must not be connected in this case (see Figure 9.3).
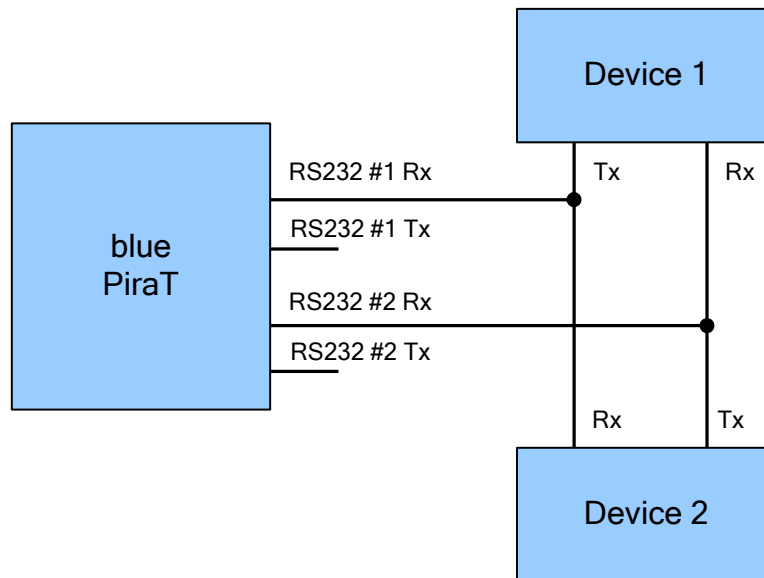
Figure 9.3: Listening to a bidirectional serial communication

9.3. Adapter cables for Analog/Digital

The Figure 9.4 shows the adapter cables for ECL, 4x digital IN, 8x analog IN and 2x digital OUT.
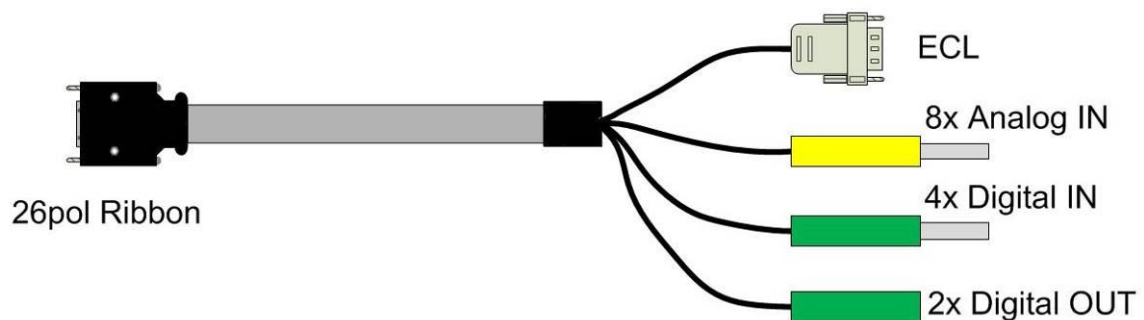
Figure 9.4: Adapter cables for digital/analog

This adapter cable is only for the logger types: 150M14C8LFR and 25M24C8LFR

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9.4. Adapter cable FlexRay

The Figure 9.5 shows the adapter cables for FlexRay (only for blue PiraT2 150M14C8LFR).

Figure 9.5: Adapter cables for FlexRay

9.5. Adapter cables for CAN/FlexRay

The Figure 9.6 shows the adapter cables for 10x High Speed CAN and FlexRay (only for blue PiraT2 25M24C8LFR).
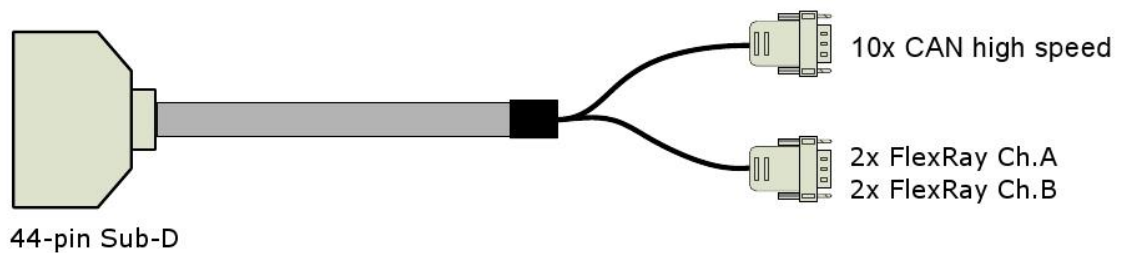
Figure 9.6: Adapter cables for CAN/FlexRay

9.6. Adapter cable for Remote Control Voice (RCV)
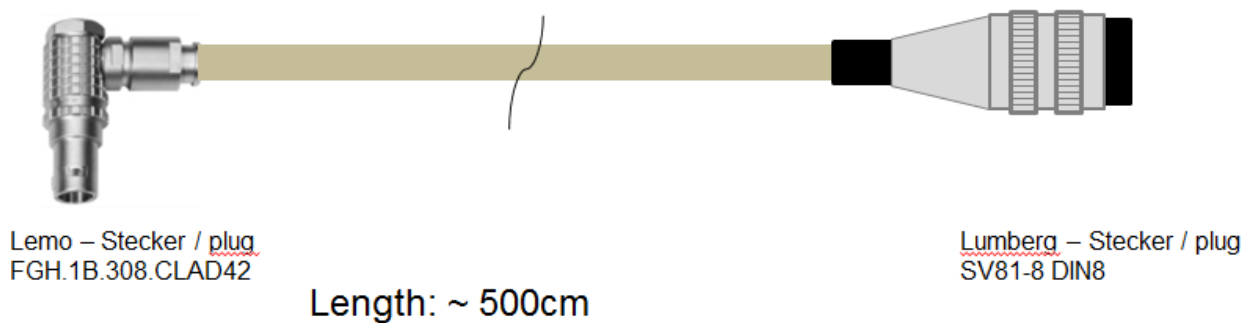
Figure 9.7: Adapter cable for Remote Control Voice (RCV)

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9.7.   Adapter cables Ethernet Kit

The Figure 9.8 shows the Ethernet box with four interfaces. This would be connected with a FCI-cable to the blue PiraT2.

This kit is available only for blue PiraT2 because blue PiraT2 5E has an integrated 4-port switch.

Figure 9.8: Adapter box cable for Ethernet

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10.   Logging data

10.1.   Setting markers

Interesting points in time can be designated by the **[Trigger]** button at the front panel or at the Remote Control. When pressing this button, the data logger saves the current time to hard drive. It is possible to configure the data logger to send a CAN message as an acknowledgement of setting a marker. Besides using the [Trigger] button, it is also possible using the digital inputs and "Complex triggers" function to realize an external [marker] button (have a look at the "Complex Triggers" user guide). Additionally, it is possible to define a CAN message that triggers a marker. In all cases, marker triggers are debounced.

When downloading the data, the Client displays all markers in a data in the data overview, the Client can be configured to transfer the data close around selected markers.

10.1.1.   Setting marker with an extern push button

Besides using the **[On / Trigger]** button, it is also possible using the digital inputs and *Complex triggers* function to realize an external **[Marker]** button. Important is to set the used interface active and set the **[Sampling Interval]** to 100 ms or more.
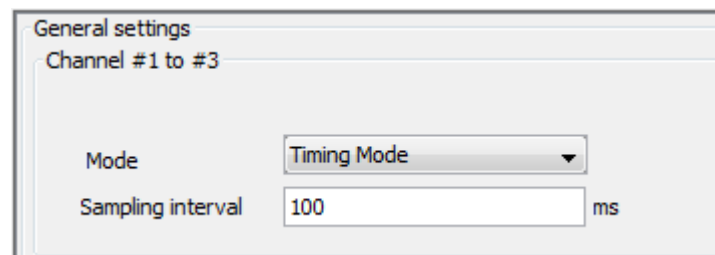
Figure 10.1: Sampling interval

Figure 10.2: setting Trigger with Digital Input

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The setting for the **[Sampling Interval]** is needed to debounce the external push button and be sure that only one trigger is set. The external push button can be connected to the power supply of the car and the Digital In mentioned above.

10.2.   Time stamp

Usually the recorded messages will get a time stamp at the end of each received message. Only for the serial interface (RS232) the time of the start of the transfer will be used.

Trace Data	Accuracy	Start	End
MOST25	1 µs		x
MOST150	1 µs		x
ECL	1 µs		x
CAN	1 µs		x
LIN	1 µs		x
FlexRay	1 µs		x
Ethernet	100 ms		x
RS232/422Digital	1 ms	x	

Table 10.1: Time Stamp

10.3.   Automatic daylight savings adjustment

If it is required that the data logger automatically adjusts for daylight savings, it is necessary to enable this option and to set the correct time zone in the data logger.

Please note the following issues:

- If the automatic adjustment for daylight savings is deactivated, the configured time zone is generally not critically important. It is still recommended to rather adapt the time zone than to readjust the data logger's time when moving between time zones because the data logger internally uses the location-independent universal time (UTC). Only changing the time zone avoids trace data with overlapping time stamps
- When converting trace data to the target file formats, the time zone that was configured at the time of data download is used. If a data set "A" is recorded in a time zone "A" and the data logger's time zone is changed to "B" before data download, then the final time stamps will reflect the time of time zone "B".
- To avoid problems when moving within time zones, make sure to delete all data on the data logger after changing the time zone or after changing the data logger's clock by one or more hours.

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10.4. Standby mode

The table below shows, which busses or signals are monitored for keeping the logger alive and which busses or signals are able to wake up the logger.

Interface	Keep alive	Wake up	Configurable	Comment
MOST25	✓	✓	W/A: On/Off	Light on
MOST150	✓	✓	W/A: On/Off	Light on
ECL	✓	✓	W/A: On/Off	
High Speed CAN	✓	✓	W/A: On/Off CAN1-10 ,11, 12, 15-24	
Low Speed CAN	✓	✓	W/A: On/Off CAN13-14	
LIN	✓	✓	W/A: On/Off LIN1-2, 3-4, 5-6, 7-8	
FlexRay	✓	✓	W: FlexRay1a-2b	
Serial RS232	✓	✘	A: On/Off	
Ethernet 1GBit	✓	✘	A: On/Off, Alive time	Time: General/Standby
Ethernet 100MBit	✓	✘	W: On/Off	
Analog In	✘	✘	✘	
Digital In 1	✘	✓	W: On/Off	Switch on at 9.5V ± 0.3V
Digital In 2	✘	✓	W: On/Off	Switch on at 2.5V ± 0.3V
Digital In 3-5	✘	✘	✘	
USB	✘	✘	✘	
Remote Control	✘	✓	✘	Via [Trigger] button
[Trigger] Button	✘	✓	✘	
Wi-Fi	✘	✘	✘	

Table 10.2: Standby [W= wake up A= keep alive]

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10.5.   Internal Memory space and level

About the ring buffer, and other options such as the protection of areas around markers, the characteristics of the logger can be configured what to do when the internal memory is full.

The following status messages can occur during operation of the data logger, it will also be displayed on the optional Remote Control (RC) / Remote Control Voice (RCV)

.

10.5.1.   Status Logger: OK

Everything is OK.

On the internal memory is enough free space to record all incoming data.
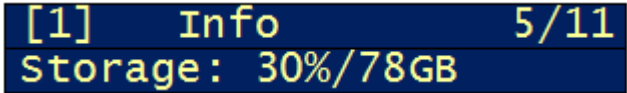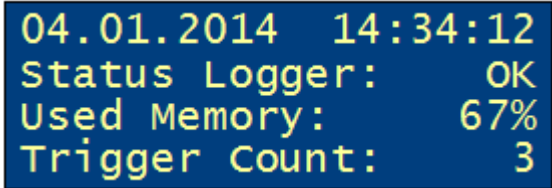
blue PiraT2:	Memory LED is off
blue PiraT2 Display:	On the info page the display of blue PiraT2 shows the level and capacity of the storage medium. [1] Info 5/11 Storage: 30%/78GB
RCV:	04.01.2014 14:34:12 Status Logger: OK Used Memory: 67% Trigger Count: 3

Table 10.3: Status Logger: OK
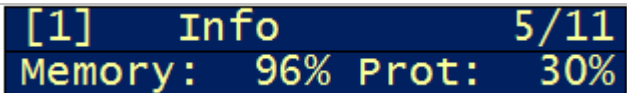
10.5.2.   Status Logger: WARN

Warning, but does not affect the data recording.

10.5.3.   Logger Status: RING

Memory is full, buffer mode is active.

The buffer is active and filled more the 95 %. Older data will be deleted to save space for newer data.

blue PiraT2:	Memory LED is off
blue PiraT2 Display:	[1] Info 5/11 Memory: 96% Prot: 30%
RCV:	Line 3 shows the level of the ring buffer on the internal memory

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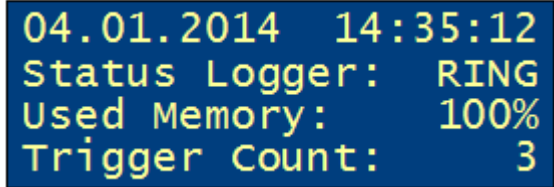
Table 10.4: Logger Status: RING

10.5.4. Status Logger: MEM

Internal memory is nearly full, no more data will be stored soon.

Case 1: The ring buffer is enabled and more than 95 % full (as Status RING), in addition over 90 % of the trace files are protected.

Case 2: The ring buffer is disabled and filled to more than 95%. When ring buffer mode is disabled all trace files are implicitly protected.
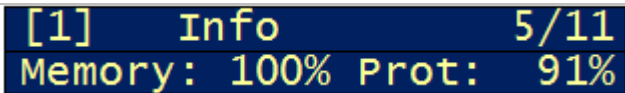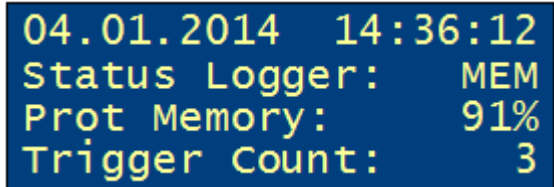
blue PiraT2:	Memory LED is off
blue PiraT2 Display:	
RCV:	Line 3 now shows the level of the ring buffer with protected files. In the display below we see that the ring buffer is filled to 91% with protected, and to 9% with non-protected files. Till now the oldest unprotected files will be cleared to make way for new space.

Table 10.5: Status Logger: MEM

Case 3: The ring buffer is disabled and the memory to 100% full.

Case 4: The ring buffer is enabled and the memory to 100% full with protected files

In both cases, the data recording is stopped because no files can be deleted to make way for new space.

blue PiraT2:	Memory LED switches on
blue PiraT2 Display:	The following message is displayed when recording medium is full (Memory: 100% Prot: 100%).

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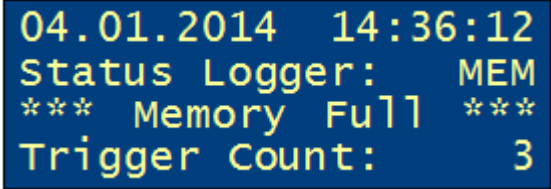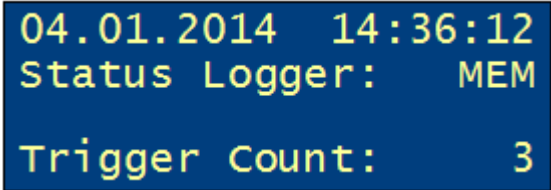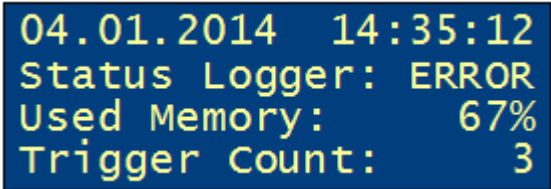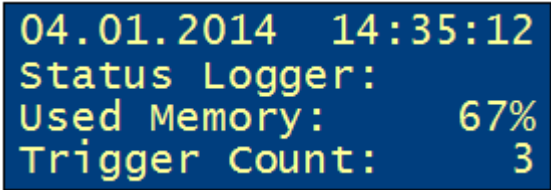
| | ```
[1]    Info          5/11
Memory: *** FULL ***
``` |
| **RCV:** | The third line shows flashing that the storage medium is full. For this, the 3rd line is faded in and out every second.<br><br>```
04.01.2014  14:36:12
Status Logger:      MEM
*** Memory Full ***
Trigger Count:        3
```<br><br>```
04.01.2014  14:36:12
Status Logger:      MEM

Trigger Count:        3
``` |

Table 10.6: Status Logger: Memory Full

10.5.5. Status Logger: NoSync

TSL or master / slave loggers are not synchronized, the data recording is not affected.

10.5.6. Status Logger: ERROR

Error in the logger, the data record is not guaranteed

blue PiraT2:	Memory LED is on
blue PiraT2 Display:	
| **RCV:** | In the second line of the status * **ERROR** * flashes every second.<br><br>```
04.01.2014  14:35:12
Status Logger: ERROR
Used Memory:        67%
Trigger Count:        3
```<br><br>```
04.01.2014  14:35:12
Status Logger:
Used Memory:        67%
Trigger Count:        3
``` |

Table 10.7: Status Logger: ERROR

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11.   Different versions and bus systems of blue PiraT 2

The different interfaces of the blue PiraT2 are described in the following chapters in more detail.

11.1.   CAN interface

The blue PiraT2 is able to record data in compliance with the CAN specification 2.0a (11 Bit identifier) and 2.0b (29 Bit identifier).

11.1.1.   The high-speed and low-speed operating modes

Depending of the model, the blue PiraT2 has different numbers of high and low speed CAN interfaces. It is not possible to change a CAN interface from low to high speed or vice versa. Each type is using different transceivers.

The electrical behavior of the low-speed and the high-speed CAN is different, hence, the low-speed CAN port of the blue PiraT2 must not be connected to a high-speed CAN bus and vice versa.

Both operating modes use differential signals (CANH, CANL). For the correct data recording, all nodes of the bus must have a common reference potential. The blue PiraT2 uses the connection "clamp 31" as a reference potential. The lines of the high-speed CANs are terminated with a high resistance.

	Low-speed CAN	High-speed CAN
Transceiver chip	Philips TJA1054	Philips TJA1041
Terminating resistor	12k	2k6
Baudrate	50 kBit/s - 125 kBit/s	50 kBit/s - 1 MBit/s
Supported identifiers (SW)	11 and 29 Bit	11 and 29 Bit
Disabling of acknowledge	possible	possible
Time stamps	at the end of the telegram	at the end of the telegram

Table 11.2: Technical data of CAN recording

11.1.2.   CAN data with 29Bit identifiers

The blue PiraT2 can also log CAN data with 29 Bit identifiers. You don't have to configure anything. All the CAN data will be logged as they are available on the CAN bus. It is also possible to log CAN messages mixed with 11 Bit and 29 Bit identifiers.

There is no configuration sheet for 29 Bit in the client. Filtering and using CAN data bases is supported in the client. The License "Complex Triggers" for blue PiraT2 also supports 11 Bit and 29 Bit identifiers.

11.1.3.   Recording contents

The blue PiraT2 is able to record the following error states of the CAN bus:

- Stuff error
- Format error
- Acknowledge error
- Bit 0/1 error
- CRC error
- Overrun

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These error states are only included in the Telemotive file formats. After reaching a certain number of errors (50 errors), the recording of error states is interrupted until reception of the next successful CAN message to avoid an overload of the recorded data.

11.1.4.   Sending CAN messages

If the blue PiraT2 sends a CAN message, it is shown twice in the trace. The first message indicates the transmit request of the data logger and the second message indicates the actual transmission of the message. In the CANoe file format, these messages are indicated as "TxRq" and "Tx", respectively. The transmit request messages are not included in file format that don't support them.

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11.2.   LIN interfaces

The blue PiraT2 is able to record data compliant to the LIN specification V1.3 V2.0 and V2.1. The data logger does not actively appear as a bus member. Sending LIN messages is currently not supported.

channels	Up to 4
transmission rate	1200, 2400, 4800, 9600, 19200, 20000 Baud
transmitter	TJA 1020
state	Parity BITS; format Check for Header, CheckSum for Header and Payload
terminating resistor	30 kOhm

Table 11.1: LIN

11.2.1.   LIN data blocks and time stamps

Each LIN message receives a time stamp, which marks the end of the message. If the data logger receives LIN data without a valid header, it creates blocks containing the erroneous data. The maximum block size is 10 bytes. A block is also concluded after a timeout, which is three times the transmission time of a LIN character.

11.2.2.   LIN-Transceiver

The blue PiraT2 uses the LIN transceiver TJA1021 by NXP (former Philips Semiconductor). Supported baud rates are in the range from 1200 to 20000 Baud. Automatic baud rate detection is currently not supported. The LIN interface is configured as a slave device with a terminating resistor of 30 kΩ.

11.2.3.   Special frames and states

Additionally to the normal frame data, the following information is recorded:

- Wakeup Frames
- Checksum Errors

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11.3. Serial (RS232) interfaces

Channels:	6x RS232
Data Bits:	5, 6, 7, 8
Stop Bits:	1, 2, 1.5
Parity:	None, odd, even

Table 11.2: Serial Port

The blue PiraT2 supports only the RS232 specification.

11.3.1. Segmentation of the serial data

The received serial Bytes are clustered into data blocks separately for each channel. Each block is finalized after a certain time or if it has reached a certain maximum size. The time is 30ms to 60ms, depending on the channel. The maximum size is 49 to 80 bytes. A time stamp is assigned to each block when it is finalized.

11.3.2. RS232 transceiver

The threshold voltages for data reception are the usual RS232-defined values. A logical „1" is recognized for input voltages smaller 0 Volts, a logical „0" for input voltages higher than 3 Volts.

11.4. FlexRay interfaces

The blue PiraT2 is able to record FlexRay bus data according to the FlexRay specification 2.1A. Table 11.3 shows the technical data of the FlexRay module.

The data logger records all valid and also invalid static and dynamic frames of the two FlexRay channels, including 'a' and 'b', independently if the FlexRay bus is in a synchronous or asynchronous state.

Channels:	2x (a + b)
Max. Bit rate:	10 MBit/s
Frames	Static, Dynamic, Null Sync, Startup
Transceiver:	AS8221

Table 11.3: Technical data of the FlexRay module

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11.5.   Ethernet interfaces

All versions of the blue PiraT2 data logger are able to log Ethernet data. All data loggers have a 1GBit Ethernet port with RJ45 connector on the front. On the back side there is a FCI connector which provides four 100MBit Ethernet interfaces.

A small box is available for breaking off this four Ethernet ports to RJ45 plugs.

Usually the 1GBit port will be used for connecting the data logger with a PC.

11.5.1.   Supported protocols & functions

The following chapter gives an overview of the available protocols. When a protocol requires a license, this will be marked.

11.5.1.1.   GNLogger

For connecting it will be used a standard TCP connect (open socket connection). Therefore the blue PiraT2 is a TCP-Slave Device.

GNLogger is a proprietary serial protocol used for some ECU diagnosis.

11.5.1.2.   UTF8

When using the UTF8 data transmission over TCP, the blue PiraT2 will be a TCP-Slave device. Therefore the blue PiraT2 will initiate a TCP connection to a TCP server by using an open socket connection (you can configure IP/Port of server via client software).

By using UTF8 data transmission the logger will write a timestamp after every detected Linefeed (LF) from the incoming data.

If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

11.5.1.3.   RAW

When using the raw data transmission over TCP the blue PiraT2 will be a TCP-Slave device. Therefore the blue PiraT2 will initiate a TCP connection to a TCP server by using an open socket connection (you can configure IP/Port of server via client software).

When using raw data transmission, every data package up to 40kBytes is getting a time stamp and will be written on the logger.

If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

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11.5.1.4.   UDP server

The blue PiraT2 can be configured as an UDP server by setting up an IP address and port number.

A Slave device can build up a connection to the blue PiraT2. The blue PiraT2 logs raw data packages up to 40kBytes and write them with a time stamp down. There is no configurable Debug Level. If the connection is getting lost, it will take about 5 seconds to build up a new connection for logging data again.

11.5.1.5.   Ethernet Spy Mode

By using the Ethernet spy mode it is possible to log the whole ethernet data (promiscuous mode).

More information can be found in the TSL client manual.

11.5.1.6.   EsoTrace

By using the EsoTrace mode it is possible to log data in the EsoTrace protocol.

More information can be found in the TSL client manual.

11.5.1.7.   Camera (license required)

If you use "Camera" license on the data logger, it is possible to connect up to 4 Ethernet webcams to the blue PiraT2. After connecting the blue PiraT2 is able to log MPEG4 video streams.

For more information please have a look at the "Camera UserGuide".

11.5.1.8.   DLT over Ethernet (license required)

If you use a "DLT" license on the data logger, it is possible to connect up to 8 ECU for logging their DLT messages.

More information about logging DLT messages can be found in the manual "DLT-logging UserGuide".

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11.6. MOST25 interface

The blue PiraT2 MOST25 data logger is able to log messages from the MOST25 bus of the following types:

state:	MPR (Maximum Position Register), SBC, Light on, MOST Lock Flag
Control:	Control Messages
Packet:	MDP (MOST Data Packet)
Filter:	Control Messages on/off, Packet on/off, MDP on/off, MDP Transmit and Receive Address, Packet Length, Status on/off

Table 11.4: MOST25 data logging

The SMSC SpyNIC MOST25 is used to provide the MOST25 traffic data. The data logger is not an active part of the bus system because it is working in a spy mode. The device is able to log messages immediately after wake up.

Before the logging data are saved on the hard disk, they are buffered in a ring buffer. In the case of a data rate peak, which exceeds the storage rate of the hard disk, storage of data is still possible. If the MOST25 data rate is permanent higher than the maximum storage rate, the data logger will stepwise deactivate channels: first the MDP-channel, then the control channel and at last the status messages. To ensure logging of maximum continuous data blocks a hysteresis is implemented. Before logging again MPD- messages the ring buffer data has to be fully stored on the hard disk.

Before starting the logging of the MDP- messages again the system sends a "Lost Message" note. This message contains information about how many messages of which type were rejected.

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11.7. MOST150

The blue PiraT2 MOST150 data logger is able to log messages from the MOST150 bus of the following types:

Status:	MPR (Maximum Position Register), MDC (MOST Data Channel), Light on, System Lock Flag, Shut Down Flag, Ring Lock Flag, Open Ring / Multi Master Flag, Node Position
Control:	Control Messages
Packet:	MDP (MOST Data Packet) MEP (MOST Ethernet Packet)
Filter:	Control Messages on/off, Packet on/off, MDP on/off, MEP on/off, Status on/off, MDP Transmit and Receive Address, Packet Length, MEP Receive Address, Message Length

Table 11.5: MOST150 data Logging

The SMSC SpyNIC MOST150 is used to provide the MOST150 traffic data.

The data logger is not an active part of the bus system because it is working in a spy mode. The device is able to log messages immediately after wake up.

Before the logging data are saved on the hard disk, they are buffered in a ring buffer. In the case of a data rate peak, which exceeds the storage rate of the hard disk, storage of data is still possible.

If the MOST150 data rate is permanent higher than the maximum storage rate, the data logger will stepwise deactivate channels: first the MEP- and MDP-channel, then the control channel and at last the status messages. To ensure logging of maximum continuous data blocks a hysteresis is implemented. Before logging again MEP- and MPD- messages the ring buffer data has to be fully stored on the hard disk.

Before starting the logging of the MEP- and MDP- messages again the system sends a "Lost Message" note. This message contains information about how many messages of which type were rejected.

11.8. ECL logging

Currently the ECL (Electrical Control Line) is only supported in conjunction with MOST150. In general, the ECL is a slow LIN bus. The following ECL messages will be recorded:

- EWU (Electrical Wake–Up)
- STWU (System Test Wake-Up)
- STP (System Test Parameters)
- STR (System Test Results)
- Undefined Pulse

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12.   Conversion of recorded traces

All trace data will be recorded internally in the proprietary Telemotive TMT format (*.tmt). If the recorded trace data will be downloaded and sorted, the data will be converted to an extended TMT format (*.xtmt).

The client provides the possibility to convert the internal format in other formats, to make the data readable or to prepare them to import them into available analyzing tools.

For more information about the file formats and an detailed manual for conversion please look at the ***TSL-Client_UserManual*** which you can download from the Telemotive ServiceCenter.

12.1.   Conversion format overview

The table below show which data can be converts to other formats. The last row shows if the marker can be integrated into the data **(x)** or only be set by using pseudo CAN- or MOST messages **(x*).**

Format / format	MOST150 CTRL	MOST150 MDP	MOST150 MEP	MOST150 Streaming	MOST25 Control	MOST25 MDP	CAN	LIN	FlexRay	Serial RS232	Ethernet	Analog IN	Digital IN	Kamera/Video	CCP	XCP	GPS	Marker
Telemotive ASCII *.txt	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
CANoe ASCII *.asc					x	x	x	x	x									x*
CANCorder *.asc							x											x
CANoe BLF *.blf	x	x	x		x	x	x	x	x		x							x*
MOST Data Analyser *.img	x	x	x	x	x	x												x*
Optolyzer *.op2					x													x*
Serial Trace Analyser *.txt										x								x
RAW Serial *.txt										x								
Serial Debug *.txt										x								x
ASCII Hexadecimal *.txt										x								
APN ASCII *.txt										x								
GN-Log *.[x]aa										x	x							x
Trace Client *.trc										x								
TCPdump *.pcap		x									x							
MDF Logging *.log							x											
MDF CAN Signal v3.3 *.mdf							x								x	x		
Autosar DLT *.dlt										x	x							
Ethernet Raw *.raw											x							
MPEG-4 *.mpeg4														x				
Extended Telemotive *.xtmt	x	x	x	x	x	x	x	x	x	x	x	x	x		x	x	x	x
Eso Trace *.esotrace											x							x
NMEA - ASCII GPS *.nmea																	x	
KML Google Maps *.kml																	x	x
KMZ comp.Google Maps *.kmz																	x	x
GPX *.gpx																	x	
MPEG-Transportstream *.ts				x														

Table 12.1: Conversion formats

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13.   Service and safety instructions

Note according to standard EN55011:2009
The data logger is used in an industrial environment. Due to the behavior of conducted as well as radiated disturbances it possibly can be difficult to ensure electromagnetic compatibility in other environments.

Cleaning:
The data logger should only be cleaned with a clean, slightly dampened cleaning cloth with water. Other cleaning supplies such as benzine, alcohol, etc. may not be used.

Maintenance:
The data logger is maintenance-free. The customer is not allowed to open the housing. Unauthorized modifications will void the warranty.

Fuse:
In case of an error the customer may change the fuse on the harness or externally accessible fuses only. The fuse may be replaced only with a fuse of the same type and current rating.

Disposal:
The disposal of the device must be in accordance to statutory provisions.

13.1.   Safety advice

Installation instructions:
The data logger should only be installed in the six axes.

Operating temperature:
The device must not be operated outside of the specified temperature range. It is important to ensure adequate ventilation. The data logger must not be placed too close to walls or other equipment. The data logger must not be stacked together with other components on each other, unless proper ventilation is ensured and the device should be used in ambient temperatures of more than 25 ° C.

Storage conditions:
The data logger must be stored only in the range of -30 ° C to 70 ° C.

Condensation:
The device must not be switched on directly, if it is brought from a cold environment into a room with normal ambient conditions.

Environmental conditions:
The device must not be used outdoors or in adverse environmental conditions such as moisture, high humidity or dust. Furthermore, an operation of the device is not allowed in fire hazardous or explosive gases.

Cable sets:
When inserting the cable sets, only a small effort may be applied. When you feel an increased resistance while inserting the cable set, the correct alignment of the pins should be checked.

It may only be used the original Telemotive components. Other components such as special cable sets have to be prepared strictly according to the pin assignment in the user guide, which always should consist an extra fuse in the wiring harness.

Three pins with the names KL30 and KL 31 are interconnected for the voltage supply of the data logger. **Caution:** A short circuit between the KL30 and KL31 on the plug may lead to the destruction of the data logger!

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The maximum value of the power supply must not exceed 13.8 V. In case of overvoltage, the device can be destroyed and will void the warranty.

Mounting:
The data logger has to be fixed in laboratory setups and especially in automobiles, so that it is secured against falling, slipping and skidding around.

Positioning of the antenna:
During operation of the data logger in an automobile, the antennas which are connected to the data logger must not be located outside the vehicle.

Mechanical action:

++++++++++++++ Operation environment ++++++++++++++

Height -300 to 5.500 m

Shock at 2 ms half sinusoidal wave	300 G
Vibration sinusoidal wave	3 G (10 - 50 Hz)
	2,5 G (50 - 2000 Hz)
	2 G (200 - 5000 Hz)

++++++++++++++ Out of operation environment ++++++++++++++

Height -300 to 12.000 m

Shock at 1 ms half sinusoidal wave	800 G
Vibration sinusoidal wave	up to 5 G (10 - 500 Hz)

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14. Data sheet

14.1. Technical data

General data	blue PiraT2	blue PiraT2 5E
Nominal power supply voltage	13,8V	13,8V
Power supply voltage	6.5 to 32 V (needs at system start up to >8,5V)	5 to 32 V (needs at system start up to >8,5V)
Reverse polarity protection of the supply voltage	Yes	Yes
Resistance to short-circuiting	Yes	Yes
Operating current (typ.)	1,8 A (@ 13,8 V)	1,8 A (@ 13,8 V)
Operating current (peak)	10 A (startup current, max 5 ms.)	10 A (startup current, max 5 ms.)
Standby current	< 10mA uo tp HW 1.4 < 3 mA from HW 1.5	< 3 mA without first frame mode < 6 mA + 3 mA *n in first fram mode (n = number of CAN channels in first frame mode)
Suspend Mode	No Suspend Mode	First frame mode for max. 8 CAN channels (LS- or HS- CAN)
Operating temperature	-30°C to 60°C	-30°C to 60°C
Storage temperature	-30°C to 70°C	-30°C to 70°C
Weight (ca.)	2,4 kg	tbd
Power backup	no	Yes, > 30 ms
Power Management	**blue PiraT2**	**blue PiraT2 5E**
Startup time	< 30s (from standby to full operation)	
Startup Logging	CAN, LIN, Serielll, Analog (#1, #2), Digital (#1) < 25ms	CAN, LIN, Serielll, Analog (#1, #2), Digital (#1) < 25ms FirstFrame mode for CAN
	FlexRay, MOST, Digital (#2 to #5) < 45ms	like blue PiraT2
	Analog (#3 to #10) < 53ms Ethernet < 18s	like blue PiraT2
Standby Mode	Configurable time by no bus load	like blue PiraT2
Wake	MOST, CAN-HS, CAN-LS, LIN, FlexRay, Digital (#1 , #2),KL 15, Trigger button	like blue PiraT2 + serial, where every port is configurable
Case	**blue PiraT2**	**blue PiraT2 5E**
Size (ca.)	9.02" x 6.23" x 1.97" (275 mm x 190 mm x 60 mm)	like blue PiraT2
Operating controls	Pushbutton to startup data logger and set markers Pushbutton to shutdown Menu button	like blue PiraT2
Display	two line display Active-LED (green): Displays data logger activity Error-LED (red): Displays internal errors Memory-LED (yellow): Displays memory warnings CFActiv (green)	like blue PiraT2
Connectors	**blue PiraT2**	**blue PiraT2 5E**
Connectors (front)	Gbit Ethernet, Wi-Fi 802.11 b/g/n (optional), GPS (optional), CF-Flash, USB 2.0 type A	like blue PiraT2 + USB 2.0 type B
BP2 150M14C8LFR (back))	Power supply, 12 x HS-CAN, 2 x LS-CAN, 8 x LIN, 4 x ETH, 6 x serial, 10 x Analog input, 5x Digital input, 3x Digital output, 2x(a/b) FlexRay,	like blue PiraT2 without Rosenberger (USB) + 4xRJ45 (Ethernet), power supply in separate cable

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	MOST150, Rosenberger (2xUSB 2.0 type A, 1xUSB 2.0 type B)	
BP2 25M24C8LFR **(back)**	Power supply, 22 x HS-CAN, 2 x LS-CAN, 8 x LIN, 4 x ETH, 6 x serial, 10 x Analog input, 5x Digital input, 3x Digital output, 2x(a/b) FlexRay, MOST25, Rosenberger (2xUSB 2.0 type A, 1xUSB 2.0 type B)	like blue PiraT2 without Rosenberger (USB) + 4xRJ45 (Ethernet), power supply in separate cable
BP2 14C6S8L **(back)**	Power supply, 12 x HS-CAN, 2 x LS-CAN, 8 x LIN, 4 x ETH, 6 x serial, 2 x Analog input, 1 x Digital input, 1 x Digital output, Rosenberger (2xUSB 2.0 type A, 1xUSB 2.0 type B)	like blue PiraT2 without Rosenberger (USB) + 4xRJ45 (Ethernet), power supply in separate cable
Data recording	**blue PiraT2**	**blue PiraT2 5E**
Storage type	Hard drive 2,5" 100GB	like blue PiraT2 (SSD optional)
	CF- card (no trace data)	like blue PiraT2
	USB flash drive (no trace data)	like blue PiraT2
Recording modes	Normal, circular buffer	like blue PiraT2
Timestamp accuracy	1µs (MOST, CAN, LIN, FlexRay) 1ms (Seriell) 100ms (Ethernet)	like blue PiraT2
MOST 150 recording BP2 150M14C8LFR	**blue PiraT2**	**blue PiraT2 5E**
Channel	MDP MOST data packets, MEP MOST Ethernet packets, control channel, Network Status, MOST streaming (Synchron / Isochron) (option)	like blue PiraT2
Status recording	Light on/off, Lock on/off	like blue PiraT2
Filter	MDP filter (source address, target address), MEP filter (target MAC address)	like blue PiraT2
MOST25 recording BP2 25M24C8LFR	**blue PiraT2**	**blue PiraT2 5E**
Channel	MDP MOST data packets, control channel, Network Status,	like blue PiraT2
Status recording	Light on/off, Lock on/off	like blue PiraT2
Filter	MDP filter (source address, target address)	like blue PiraT2
CAN recording All types	**blue PiraT2**	**blue PiraT2 5E**
Channel	BP2 150M14C8LFR: 12 High speed, 2 Low speed BP2 25M24C8LFR: 22 High speed, 2 Low speed	like blue PiraT2
Baud rate	up to1000000 Baud at HS-CAN up to 125000 Baud at LS-CAN	like blue PiraT2
Transceiver	TJA1041A, TJA1054A	TJA1041A, TJA1055T
Filter	CAN ID Filter	like blue PiraT2
Status recording	Error frames	like blue PiraT2
FirstFrame-mode	no	yes
Serielle recording All types	**blue PiraT2**	**blue PiraT2 5E**
Type	RS232	like blue PiraT2
Channel	6	like blue PiraT2
Baud rate	1200, 2400, 4800, 9600, 19200, 38400, 57600, 115200, 230400, 460800, 921600 Baud	like blue PiraT2

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Data Bits	5,6,7,8	like blue PiraT2
Stop Bits	1,1.5,2	like blue PiraT2
Parity	none, odd, even	like blue PiraT2
LIN recording All types	**blue PiraT2**	**blue PiraT2 5E**
Channel	8	like blue PiraT2
Baud rate	1200, 2400, 4800, 9600, 10400, 19200, 20000 Baud	like blue PiraT2
Tranceiver	TJA1021	like blue PiraT2
FlexRay recording not in BP2 14C6S8L	**blue PiraT2**	**blue PiraT2 5E**
Channel	2x(a/b)	like blue PiraT2
Bit rate	up to10 Mbit/s	like blue PiraT2
Tranceiver	AS8221B	like blue PiraT2
Recording	Null frames, Startup Phase, Trailer CRC, Symbol	like blue PiraT2
Ethernet recording	**blue PiraT2**	**blue PiraT2 5E**
Channel **Baud rate**	5 1x1GBit/s (front side) 4x100Mbit/s (rear side)	like blue PiraT2 Ethernet port at the rear side has 1000 Mbit/s too
Recording	GN-Log, raw, UTF8, UDP, DLT (optional), EsoTrace (optional)	like blue PiraT2
Analog recording **(#1 and #2)** All types	**blue PiraT2**	**blue PiraT2 5E**
Channel	1xUbat (internal), 1x external	like blue PiraT2
Range of measurement	0 V - +20 V	like blue PiraT2
Resolution	7 mV	like blue PiraT2
Accuracy	3%	like blue PiraT2
Sampling interval	1ms to 100s	like blue PiraT2
Digital input (#1) All types	**blue PiraT2**	**blue PiraT2 5E**
Channel	1	like blue PiraT2
Switching threshold	9,5V ±0,2 V	like blue PiraT2
Hysteresis	0,3 V ±0,2 V	like blue PiraT2
Sampling interval	1ms to 100s	like blue PiraT2
Digital output (#1) All types	**blue PiraT2**	**blue PiraT2 5E**
Channel	1	like blue PiraT2
Output voltage	~Ubat	like blue PiraT2
Output current	Up to 1 A	like blue PiraT2
Analog recording **(#3 to #10)** not in BP2 14C6S8L	**blue PiraT2**	**blue PiraT2 5E**
Channel	8	like blue PiraT2
Range of measurement	-10V to +20V	like blue PiraT2
Resolution	8mV	like blue PiraT2

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Accuracy	3%	like blue PiraT2
Sampling interval	1ms to 100s	like blue PiraT2
Digitale input **(#2 to #5)** not in BP2 14C6S8L	**blue PiraT2**	**blue PiraT2 5E**
Channel	4	like blue PiraT2
Switching threshold	Configurable between 0V and 12V	like blue PiraT2
Hysteresis	3,2 V ±2V	like blue PiraT2
Sampling interval	1ms to 100s	like blue PiraT2
Digital output **(#2 to #3)** not in BP2 14C6S8L	**blue PiraT2**	**blue PiraT2 5E**
Channel	2	like blue PiraT2
Output voltage	~ Ubat	like blue PiraT2
Output current	up to 0.5 A (continuous load) BP2 150M14C8LFR	like blue PiraT2
	up to 1.0 A (continuous load) BP2 25M24C8LFR	like blue PiraT2

Table 14.1: Datasheet

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15. Pin assignments and harnesses

Part	For Vehicle	150M14C8LFR	25M24C8LFR	14C6S8L
blue PiraT2 universal harness see section: 15.1 Data logger: Multi-function connector	Power, GND, Wake	✓	✓	✓
	12x high speed CAN			
	2x low speed CAN			
	8x LIN			
	1x digital out			
	Remote Control I/F			
blue PiraT2 Serial/UART extension harness see section: 15.2 Serial connector (D-Sub 26)	6x RS232	✓	✓	✓
	1x Analog in			
	1x Digital in			
blue PiraT2 Analog/Digital extension harness see section: 15.3Analog / Digital connector (26-pin) (not at 14C6S8L)	8x Analog in	✓	✓	-
	4x Digital in			
	2x Digital out			
	1x ECL			
blue PiraT2 FlexRay extension harness see section: 15.5 FlexRay connector (150M14C8LFR only)	2x FlexRay a	✓	-	-
	2x FlexRay b			
blue PiraT2 CAN/FlexRay extension harness see section: 15.6CAN/FlexRay (D-Sub 44) (25M24C8LFR only)	10x high speed CAN	-	✓	-
	2x FlexRay a			
	2x FlexRay b			
blue PiraT2 Ethernet extension kit see section: 15.8 Pinning of the FCI connector for the Ethernet-Kit	4x Ethernet RJ45	✓	✓	✓

Table 15.1: extension harness overview

Warning:
Clamp 31 should be the only ground connection between the data logger and connected devices. Connecting signal ground lines is limited to special cases in which one can guarantee that ground loops cannot occur.

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Figure 15.1: Back side "blue PiraT2_14C6S8L"

Figure 15.2: Back side "blue PiraT2_ 25M24C8LFR"

Figure 15.3: Back side "blue PiraT2_ 150M14C8LFR"

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15.1.   Data logger: Multi-function connector

Name	Type	Manufacturer-Nr.	Manufacturer
ELO 54pin	Shield	1-1355928-2	Tyco
	Housing	1355929-2	Tyco
	Housing	1355930-2	Tyco
	Contakt	2-1411550-1	Tyco

Table 15.2: MQS 54pin

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
MQS 54pin	Signal		Type	Pin
1	KL15_Wake	Wake Up from KL15	banana plug blue	----
2	HSCAN_L_11	High Speed CAN #11 LOW	DSUB-9 / male	2
3	HSCAN_L_10	High Speed CAN #10 LOW	DSUB-9 / male	2
4	HSCAN_L_9	High Speed CAN #09 LOW	DSUB-9 / male	2
5	HSCAN_L_8	High Speed CAN #08 LOW	DSUB-9 / male	2
6	HSCAN_L_7	High Speed CAN #07 LOW	DSUB-9 / male	2
7	HSCAN_L_6	High Speed CAN #06 LOW	DSUB-9 / male	2
8	HSCAN_L_5	High Speed CAN #05 LOW	DSUB-9 / male	2
9	HSCAN_L_4	High Speed CAN #04 LOW	DSUB-9 / male	2
10	HSCAN_L_3	High Speed CAN #03 LOW	DSUB-9 / male	2
11	HSCAN_L_2	High Speed CAN #02 LOW	DSUB-9 / male	2
12	HSCAN_L_1	High Speed CAN #01 LOW	DSUB-9 / male	2
13	LSCAN_L_1	Low Speed CAN #13 LOW	DSUB-9 / male	2
14	LIN_CON_7	LIN #7	DSUB-9 / male	7
15	TOUT_BAT	NA (rfu)	open	----
16	NA	Not connected	-----------------------	----
17	NA	Not connected	-----------------------	----
18	DIG_OUT_1	Digital OUT #01	banana jack green	----
19	HSCAN_H_12	High Speed CAN #12 HIGH	DSUB-9 / male	7
20	HSCAN_H_11	High Speed CAN #11 HIGH	DSUB-9 / male	7
21	HSCAN_H_10	High Speed CAN #10 HIGH	DSUB-9 / male	7
22	HSCAN_H_9	High Speed CAN #09 HIGH	DSUB-9 / male	7
23	HSCAN_H_8	High Speed CAN #08 HIGH	DSUB-9 / male	7
24	HSCAN_H_7	High Speed CAN #07 HIGH	DSUB-9 / male	7
25	HSCAN_H_6	High Speed CAN #06 HIGH	DSUB-9 / male	7
26	HSCAN_H_5	High Speed CAN #05 HIGH	DSUB-9 / male	7
27	HSCAN_H_4	High Speed CAN #04 HIGH	DSUB-9 / male	7
28	HSCAN_H_3	High Speed CAN #03 HIGH	DSUB-9 / male	7
29	HSCAN_H_2	High Speed CAN #02 HIGH	DSUB-9 / male	7
30	HSCAN_H_1	High Speed CAN #01 HIGH	DSUB-9 / male	7
31	LSCAN_H_1	Low Speed CAN #13 HIGH	DSUB-9 / male	7
32	LIN_CON_8	LIN #08	DSUB-9 / male	7
33	RIN_BAT	NA (rfu)	open	----
34	NA	Not connected (rfu)	-----------------------	----
35	KL30	Please combine pins 35, 37, 39 for the KL30	banana plug red	----
36	NA	Not connected (rfu)	-----------------------	----
37	KL30	Please combine pins 35, 37, 39 for the KL30	banana plug red	----
38	HSCAN_L_12	High Speed CAN #12 LOW	DSUB-9 / male	2
39	KL30	Please combine pins 35, 37, 39 for the KL30	banana plug red	----

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40	TT_OUT_CON	Clock_Out for cascading device	Lumberg KV81-8	4
41	TT_IN_CON	Clock_IN for cascading device	Lumberg KV81-8	5
42	LIN_CON_1	LIN #01	DSUB-9 / male	7
43	LIN_CON_2	LIN #02	DSUB-9 / male	7
44	LIN_CON_3	LIN #03	DSUB-9 / male	7
45	LSCAN_L_2	Low Speed CAN #14 LOW	DSUB-9 / male	2
46	LSCAN_H_2	Low Speed CAN #14 HIGH	DSUB-9 / male	7
47	LIN_CON_4	LIN #04	DSUB-9 / male	7
48	LIN_CON_5	LIN #05	DSUB-9 / male	7
49	LIN_CON_6	LIN #06	DSUB-9 / male	7
50	LSCAN_L_RC	CAN RemoteControl	LUMBERG KV81-8	1
51	LSCAN_H_RC	CAN RemoteControl	LUMBERG KV81-8	3
52	KL31	Please combine pins 52, 53, 54 for the KL31	banana plug **black**	----
53	KL31	Please combine pins 52, 53, 54 for the KL31	banana plug **black**	----
54	KL31	Please combine pins 52, 53, 54 for the KL31	banana plug **black**	----

Table 15.3: Pin assignment of the multi-function connector

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15.2. Serial connector (D-Sub 26)

The 26-pin D-Sub connector combines RS232, digital and analog interfaces.

Name	Type	Manufacturer-Nr.	Manufacturer
DSUB 26pin	Connector	HD 26F	(Reichelt)
	Shell	1-1478762-5	Tyco

Table 15.4: D-SUB 26pin

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
D-SUB 26pin	Signal		Type	Pin
1	RS232_TOUT_1	RS232 #1 Tx	DSUB-9 / male	3
2	RS232_ROUT_1	RS232 #1 Rx	DSUB-9 / male	2
3	RS232_TOUT_2	RS232 #2 Tx	DSUB-9 / male	3
4	RS232_ROUT_2	RS232 #2 Rx	DSUB-9 / male	2
5	NA	Not connected	---------------------	----
6	NA	Not connected	---------------------	----
7	NA	Not connected	---------------------	----
8	NA	Not connected	---------------------	----
9	NA	Not connected	---------------------	----
10	RS232_TOUT_3	RS232 #3 Tx	DSUB-9 / male	3
11	RS232_ROUT_3	RS232 #3 Rx	DSUB-9 / male	2
12	RS232_TOUT_4	RS232 #4 Tx	DSUB-9 / male	3
13	RS232_ROUT_4	RS232 #4 Rx	DSUB-9 / male	2
14	NA	Not connected	---------------------	----
15	NA	Not connected	---------------------	----
16	TT_CASCADE_CON	NA (rfu)	---------------------	----
17	NA	Not connected	---------------------	----
18	ANA_IN_GND_2	Please connect ANA_IN_GND_2 to KL31	banana plug **yellow**	----
19	RS232_TOUT_5	RS232 #5 Tx	DSUB-9 / male	3
20	RS232_ROUT_5	RS232 #5 Rx	DSUB-9 / male	2
21	RS232_TOUT_6	RS232 #6 Tx	DSUB-9 / male	3
22	RS232_ROUT_6	RS232 #6 Rx	DSUB-9 / male	2
23	SYNC_CASCADE_CON	NA (rfu)	---------------------	----
24	DIG_IN_1	Digital IN #01 is referenced to KL31 with internal Pull down, Threshold 9,2 ± 0,1 Volts, Hysteresis 0,4 ± 0,1 Volt DIG_IN_1 might be used as a Marker (with a push-button to positive Supply Voltage KL30)	banana jack **green**	----
25	NA	Not connected	---------------------	----
26	ANA_INSGNL_2	Analog Interface #02 SIGNAL IN	banana plug **yellow**	----

Table 15.5: Pin assignment of the Digital/Analog connector

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15.3.   Analog / Digital connector (26-pin) (not at 14C6S8L)

Name	Type	Manufacturer-Nr.	Manufacturer
Ribbon 26pin	Plug Connector	10126-3000PE	3M
	Shell	10326-52F0-008	3M

Table 15.6: Mini D Ribbon 3M 26pin

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
3M 26pin	Signal		Type	Pin
1	DIG_IN_2	Digital IN #02 (Referenced to KL31)	banana plug **green**	----
2	DIG_IN_3	Digital IN #03 (Referenced to KL31)	banana plug **green**	----
3	DIG_IN_4	Digital IN #04 (Referenced to KL31)	banana plug **green**	----
4	DIG_IN_5	Digital IN #05 (Referenced to KL31)	banana plug **green**	----
5	DIG_OUT_2	Digital OUT #02	banana jack **green**	----
6	DIG_OUT_3	Digital OUT #03	banana jack **green**	----
7	SHIELD	NA	----------------------	----
8	SHIELD	NA	----------------------	----
9	ANA_IN_SGNL_3	Analog Interface #03 SIGNAL IN	banana plug **yellow**	----
10	ANA_IN_SGNL_4	Analog Interface #04 SIGNAL IN	banana plug **yellow**	----
11	ANA_IN_SGNL_5	Analog Interface #05 SIGNAL IN	banana plug **yellow**	----
12	ANA_IN_SGNL_6	Analog Interface #06 SIGNAL IN	banana plug **yellow**	----
13	ANA_IN_SGNL_7	Analog Interface #07 SIGNAL IN	banana plug **yellow**	----
14	ANA_IN_SGNL_8	Analog Interface #08 SIGNAL IN	banana plug **yellow**	----
15	ANA_IN_SGNL_9	Analog Interface #09 SIGNAL IN	banana plug **yellow**	----
16	ANA_IN_SGNL_10	Analog Interface #10 SIGNAL IN	banana plug **yellow**	----
17	ANA_IN_GND_3	Analog Interface #03 GROUND	banana plug **yellow**	----
18	ANA_IN_GND_4	Analog Interface #04 GROUND	banana plug **yellow**	----
19	ANA_IN_GND_5	Analog Interface #05 GROUND	banana plug **yellow**	----
20	ANA_IN_GND_6	Analog Interface #06 GROUND	banana plug **yellow**	----
21	ANA_IN_GND_7	Analog Interface #07 GROUND	banana plug **yellow**	----
22	ANA_IN_GND_8	Analog Interface #08 GROUND	banana plug **yellow**	----
23	ANA_IN_GND_9	Analog Interface #09 GROUND	banana plug **yellow**	----
24	ANA_IN_GND_10	Analog Interface #10 GROUND	banana plug **yellow**	----
25	SHIELD	NA	----------------------	----
26	ECL_IN	Electrical Control Line (SMSC)	DSUB-9 / male	7

Table 15.7: Pin assignment of the Analog/Digital connector

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15.4.   Ethernet connector

Name	Type	Manufacturer-Nr.	Manufacturer
FCI	Cable Assembly	10054999-R0050Aulf	FCI

Table 15.8: FCI-Connector (Cable assembly 50 cm)

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
3M 26pin	Signal		Type	Pin
A1	TX-	ETH1 Tx-	RJ45	2
B1	Tx+	ETH1 Tx+	RJ45	1
C1	GND			----
D1	RX+	ETH1 Rx+	RJ45	3
E1	RX-	ETH1 RX-	RJ45	6
A2	TX-	ETH2 Tx-	RJ45	2
B2	Tx+	ETH2 Tx+	RJ45	1
C2	GND			----
D2	RX+	ETH2 Rx+	RJ45	3
E2	RX-	ETH2 RX-	RJ45	6
A3	TX-	ETH3 Tx-	RJ45	2
B3	Tx+	ETH3 Tx+	RJ45	1
C3	GND			----
D3	RX+	ETH3 Rx+	RJ45	3
E3	RX-	ETH3 RX-	RJ45	6
A4	TX-	ETH4 Tx-	RJ45	2
B4	Tx+	ETH4 Tx+	RJ45	1
C4	GND			----
D4	RX+	ETH4 Rx+	RJ45	3
E4	RX-	ETH4 RX-	RJ45	6

Table 15.9: Pin assignment of the Ethernet connector

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15.5.   FlexRay connector (150M14C8LFR only)

Name	Type	Manufacturer-Nr.	Manufacturer
Ribbon 14pin	Plug Connector	10114-3000PE	3M
	Shell	10314-52F0-008	3M

Table 15.10: Mini D Ribbon 3M 14pin

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
3M 14pin	Signal		Type	Pin
1	FR_BP_1	FlexRay+ Channel 1a	DSUB-9 / male	7
2	NA	Not connected	-----------------------	----
3	FR_BP_2	FlexRay+ Channel 1b	DSUB-9 / male	7
4	NA	Not connected	-----------------------	----
5	FR_BM_2_2	FlexRay- Channel 2b	DSUB-9 / male	2
6	NA	Not connected	-----------------------	----
7	FR_BM_2_1	FlexRay- Channel 2a	DSUB-9 / male	2
8	FR_BM_1	FlexRay- Channel 1a	DSUB-9 / male	2
9	NA	Not connected	-----------------------	----
10	FR_BM_2	FlexRay- Channel 1b	DSUB-9 / male	2
11	NA	Not connected	-----------------------	----
12	FR_BP_2_2	FlexRay+ Channel 2b	DSUB-9 / male	7
13	NA	Not connected	-----------------------	----
14	FR_BP_2_1	FlexRay+ Channel 2a	DSUB-9 / male	7

Table 15.11: Pin assignment of the FlexRay connector

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15.6.   CAN/FlexRay (D-Sub 44) (25M24C8LFR only)

Name	Type	Manufacturer-Nr.	Manufacturer
DSUB 44pin	Connector	17EHD-044-P-AA-0-00	Amphenol
	Shell	17E-1726-2	Amphenol

Table 15.12: D-SUB 44pin

@ Logger		comment / depiction / signal name	@ Vehicle Interface	
D-SUB 44pin	Signal		Type	Pin
1	HSCAN_L_15	High Speed CAN #15 LOW	DSUB-9 / male	2
2	HSCAN_L_16	High Speed CAN #16 LOW	DSUB-9 / male	2
3	HSCAN_L_17	High Speed CAN #17 LOW	DSUB-9 / male	2
4	HSCAN_L_18	High Speed CAN #18 LOW	DSUB-9 / male	2
5	HSCAN_L_19	High Speed CAN #19 LOW	DSUB-9 / male	2
6	HSCAN_L_20	High Speed CAN #20 LOW	DSUB-9 / male	2
7	HSCAN_L_21	High Speed CAN #21 LOW	DSUB-9 / male	2
8	HSCAN_L_22	High Speed CAN #22 LOW	DSUB-9 / male	2
9	HSCAN_L_23	High Speed CAN #23 LOW	DSUB-9 / male	2
10	HSCAN_L_24	High Speed CAN #24 LOW	DSUB-9 / male	2
11	NA	Not connected	---------------------	----
12	FR_BM_1	FlexRay- Channel 1a	DSUB-9 / male	2
13	FR_BM_2	FlexRay- Channel 1b	DSUB-9 / male	2
14	FR_BM_2_1	FlexRay- Channel 2a	DSUB-9 / male	2
15	FR_BM_2_2	FlexRay- Channel 2b	DSUB-9 / male	2
16	HSCAN_H_15	High Speed CAN #15 HIGH	DSUB-9 / male	7
17	HSCAN_H_16	High Speed CAN #16 HIGH	DSUB-9 / male	7
18	HSCAN_H_17	High Speed CAN #17 HIGH	DSUB-9 / male	7
19	HSCAN_H_18	High Speed CAN #18 HIGH	DSUB-9 / male	7
20	HSCAN_H_19	High Speed CAN #19 HIGH	DSUB-9 / male	7
21	HSCAN_H_20	High Speed CAN #20 HIGH	DSUB-9 / male	7
22	HSCAN_H_21	High Speed CAN #21 HIGH	DSUB-9 / male	7
23	HSCAN_H_22	High Speed CAN #22 HIGH	DSUB-9 / male	7
24	HSCAN_H_23	High Speed CAN #23 HIGH	DSUB-9 / male	7
25	HSCAN_H_24	High Speed CAN #24 HIGH	DSUB-9 / male	7
26	NA	Not connected	---------------------	----
27	FR_BP_1	FlexRay+ Channel 1a	DSUB-9 / male	7
28	FR_BP_2	FlexRay+ Channel 1b	DSUB-9 / male	7
29	FR_BP_2_1	FlexRay+ Channel 2a	DSUB-9 / male	7
30	FR_BP_2_2	FlexRay+ Channel 2b	DSUB-9 / male	7
31	NA	Not connected	---------------------	----
32	NA	Not connected	---------------------	----
33	NA	Not connected	---------------------	----
34	NA	Not connected	---------------------	----
35	NA	Not connected	---------------------	----
36	NA	Not connected	---------------------	----
37	NA	Not connected	---------------------	----
38	NA	Not connected	---------------------	----
39	NA	Not connected	---------------------	----
40	NA	Not connected	---------------------	----
41	NA	Not connected	---------------------	----
42	NA	Not connected	---------------------	----
43	NA	Not connected	---------------------	----
44	NA	Not connected	---------------------	----

Table 15.13: Pin assignment of the CAN/FlexRay connector

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15.7.   Connection to Remote Control Voice

Connector KV81-8 for Remote Control / Remote Control Voice is connected to Pins 40, 41, 50, 51 of MQS54. KL30 and KL31 are directly connected to the cable harness.

@ Logger		comment / depiction / signalname	@ Customer	
MQS 54pin	Signal		Type	Pin
50	LSCAN_L_RC	CAN RemoteControl	Lumberg KV81-8	1
-------	NA	Not connected	Lumberg KV81-8	2
51	LSCAN_H_RC	CAN RemoteControl	Lumberg KV81-8	3
40	TT_OUT_CON	Clock_Out for cascading device	Lumberg KV81-8	4
41	TT_IN_CON	Clock_IN for cascading device	Lumberg KV81-8	5
-------	KL31	KL31	Lumberg KV81-8	6
-------	KL30	KL30	Lumberg KV81-8	7
-------	NA	Not connected	Lumberg KV81-8	8
-------	NA	Not connected	Lumberg KV81-8	9

Table 15.14: Contacts of the DIN plug

MQS 54pin	Lumberg KV81-8 Pin	Lemo Pin	Bananaplug Pin	Signal
40	4	-	-	TT_OUT_CON
41	5	-	-	TT_IN_CON
50	1	6	-	LSCAN_L_RC
51	3	3	-	LSCAN_H_RC
54/52/53	6	7	Black 1	KL31 (Masse, -)
35/39/37	7	2	Red 1	KL30 (Spannung, +)

Table 15.15: Contacts of the angeled Lemo plug

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15.7.1. Contacts of the Remote Control Voice cable

These drawings show the pinout of the Remote Control Voice cable

Figure 15.4: Pins des DIN-Steckers

Figure 15.5: Pins des gewinkelten LEMO-Steckers

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15.8.   Pinning of the FCI connector for the Ethernet-Kit

RJ45-Jack Pin(Signal)	1 (Tx+)	2 (Tx-)	3 (Rx+)	4	5	6 (Rx-)	7	8
FCI-Jack Pin	B1	A1	D1			E1		
	B2	A2	D2			E2		
	B3	A3	D3			E3		
	B4	A4	D4			E4		

Table 15.16: Pinning of the FCI connector for the Ethernet-Kit

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16. Abbreviations

Kürzel	Bedeutung
blue PiraT	**P**rocessing **I**nformation **R**ecording **A**nalyzing **T**ool
bP	**b**lue **P**iraT
bP2	**b**lue **P**iraT**2**
bP2 5E	**b**lue **P**iraT**2** 5E
bPMini	**b**lue **P**iraT Mini
TSL	**T**elemotive **S**ystem **L**ink
CAN	**C**ontroller **A**rea **N**etwork
LIN	**L**ocal **I**nterconnect **N**etwork
MOST	**M**edia **O**riented **S**ystems **T**ransport. (*www.mostnet.de*)
ECL	**E**lectrical **C**ontrol **L**ine
MEP	**M**OST **E**thernet **P**acket
USB	**U**niversal **S**erial **B**us
CF	**C**ompact **F**lash
SD	**S**ecure **D**igital
LAN	**L**ocal **A**erea **N**etwork = Netzwerk
FW	**F**irm**w**are
PW	**P**ass**w**ort
SFTP	**S**ecure **F**ile **T**ransfer **P**rotocol
SHA	**S**ecure **Ha**sh
SSL	**S**ecure **S**ockets **L**ayer
TLS	**T**ransport **L**ayer **S**ecurity
TMP	**T**ele**m**otive **P**acketformat
UTC	**U**niversal **T**ime, **C**oordinated
GMT	**G**reenwich **M**ean **T**ime

Table 16.1: Abbreviations

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17.   List of figures

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18.   List of tables

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19. Contact

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